mal Forms of Dogwood,' Willard N. Clute has a fifth article on 'The Making of a Herbarium,' and Mrs. Caroline A. Creevey concludes the series devoted to 'Plant Juices and their Commercial Values' with a brief paper on dye plants. C. F. Saunders notices 'The Small Mistletoe in Pennsylvania,' and the editor comments on forest preservation. Charles Louis Pollard, in the supplement presenting the 'Families of Flowering Plants,' treats of the order Glumiflorae—the grasses and sedges.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 323d regular meeting was held on Saturday, April 5th. C. H. Townsend spoke of 'The Flying Foxes of the South Pacific Islands' under this title describing the fruit bats, *Pteropus*, found during the recent voyage of the United States Fish Commission steamer *Albatross*, and illustrating his remarks with lantern slides and specimens. The speaker stated that no bats were found in Polynesia to the eastward of the Tonga and Samoa groups although search was made for them.

A large rookery of flying foxes on the island of Tongatatu was visited and many fine photographs were taken showing the bats clinging in large numbers to the tree-tops. The rookery is located in a small native settlement near Nukalofa, the bats about 8000 in number, occupying the tops of 14 large trees in the midst of the village. The rookery is carefully protected by the chief of the village, who permitted the naturalist to take away only three specimens. It was understood that they had been guarded by the people from time immemorial, although the animals are frugivorous and evidences of their depredations on the island fruits were found constantly.

Mr. Townsend collected many flying foxes at Namuka Island (Tonga group), where they were found scattered in the forest. They were seen in the Fiji and Samoan islands also but no specimens were secured.

In a paper entitled, 'Acorns as Food,' Mr. V. K. Chesnut, after briefly mentioning the various places where sweet acorns are, or were, used for human food along the Mediterranean and in the United States and Mexico, gave a special illustrated account of the interesting manufacturing and chemical processes which have gradually been evolved by the Indians of Mendocino County, California, to extract the tannin and the bitter principle from the bitter acorns. The acorns of the black oak (*Quercus californica*), chestnut oak (*Q. densiflora*), and valley white oak (*Q. lobata*), especially, constitute an important and almost essential portion of the food of these Indians during the greater part of the year.

Mr. W. A. Orton spoke on the 'Sap-flow of the Maple' in spring, giving a brief description of the methods of making maple sugar and a report of some of the investigations made at the Vermont Experiment Station under the direction of Professor L. R. Jones. Sap pressure and flow in the sugar-maple occurs at intervals from October to May, when the weather conditions are favorable, but is most active for a month during March or April. To produce sap-flow it is necessary that the temperature should rise from several degrees below the freezing-point to some degrees above it. If this change be at all sudden there will be developed a pressure within the tree of 15–25 or more lbs. per square inch. Charts showing the relation of the temperatures as measured by a self-recording thermometer, to the sap-pressure recorded by a self-recording steam-pressure gauge attached to a maple tree were exhibited, and it was shown that in general there was a very close relation between sudden rises of temperature and of sap-pressure, there being pressure on warm days followed by suction at night. Sap flow diminished toward the top of the tree. It was greatest in the outer part of the tree, but continued longer from deeper in the wood. It was concluded that the cause of sap-flow was physical rather than physiological, being due to the expansion of confined air and water in the vessels of the wood, brought about by a sudden rise of temperature. There is little if any root-pressure during the season of sap-flow, and as the trees are dormant the old question of ascent of water from roots to leaves hardly enters into the problem. The direction of sap-flow was studied by injecting lithium into the tree near the tap-hole and testing the sap with a spectroscope. It was found that

sap moves freely both up and down toward the tap-hole *with* the grain of the wood, but very little or not at all *across* the grain.

Other problems mentioned are still under investigation. F. A. Lucas.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF GEOLOGY AND MINERALOGY.

The meeting on April 16, 1900, was held at 12 West 31st Street, Dr. A. A. Julien presiding and 29 persons present.

Professor Stevenson, in behalf of the committee appointed to prepare a minute respecting the late Professor Hubbard, presented an obituary notice which is published on page 742 above.

Dr. R. Ellsworth Call presented 'Some Preliminary Notes on Crystal Growths in Mammoth Cave.' He first gave a brief resumé of the geology of the vicinity of Mammoth Cave. The strata making the geologic section are nearly horizontal and all the rocks forming the cavern are of sub-carboniferous age. The region of the cavern is capped with sandstones of the Chester Group 500 feet thick, beneath which are oölitic and other limestones, in which the cavern is excavated to a thickness of over 350 feet. The drainage level of the cavern is determined by the present level of Green River. Five different levels have existed during geologic time. No gypsiferous strata are known in the region. The overlying sandstone is usually quite ferruginous; but no pyrite occurs in either strata. Secondary crystallization has occurred in many of the stalactites causing them to simulate the fibrous appearance sometimes assumed by aragonite. The stalactites of recent origin almost all have a downward-projecting tree root as their origin of fixation, or are beneath sink-holes. The chief objects of mineralogical interest are the gypsum crystals which cover the sides and ceilings of certain avenues in the cavern, in the upper of the five levels only, and not in any levels now occupied by streams. These crystals are sometimes curiously and remarkably contorted and the terminations of the crystal masses are often recurved in a direction contrary to the direction of gravitation. Occasionally the gypsum assumes a botryoidal form, but is commonly found as needles or aggregated in loose masses of fibrous crystals. The gypsum crystals occur only along cracks, and are built up by increase from the base, while the calcium-carbonate stalactites are always built up by additions to their surface or terminations. It is difficult to account for the large amount of sulphur needed by assuming its origin in organic bodies, such as plants and the forests which are now of abundant growth in the region and have been so for geologic ages. The origin of the carbon dioxide necessary for the great work of solution which has been accomplished is likewise found in the decaying vegetation. The origin of the sulphuric acid required to produce these enormous quantities of gypsum crystals, which have fallen so abundantly as to fill up certain avenues, is still problematic. Only one other mineral is found, flocculent crystals of magnesium sulphate, pendant from the ceiling of two or three small rooms. There are no calcite or quartz crystals. The paper was illustrated by lantern slides showing the peculiarities of the stalactite and gypsum formations.

Professor Kemp, in discussion, suggested that the small percentage of sulphur present in the limestones themselves might, after solution of the latter, aggregate sufficient sulphur to afford gypsum along the crevices. Doctor Julien and Professor Stevenson each cited cases in the Caribbean and Bermuda Islands where the amount of vegetation now or formerly growing on the surface was insufficient to accomplish the solution required for the great caves which exist in the coral limestones, both of tertiary and recent growth in the islands.

A paper by Doctor E. O. Hovey, on the 'Scenery of the Harney Park District in the Black Hills, South Dakota' (illustrated with lantern slides), was read by Professor Kemp, owing to the former's unavoidable absence. After a brief resumé of the geology of the Black Hills district, a series of views was shown illustrative of the extraordinary erosion forms of the schists and pegmatites of the Harney Peak district. The photographs also showed the tin mines of the Black Hills, in which spodumene crystals of large size have recently been obtained as a valuable source of Lithium, as a commercial product. One spodumene crystal

here obtained was thirty feet long. The granite veins have also been described by Van Hise.

Discussion followed on occurrences of extraordinarily large crystals of other minerals.

THEODORE G. WHITE,
Secretary of Section.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis, on the evening of April 16th, Mr. Herbert F. Roberts, of the Henry Shaw School of Botany, addressed the Academy on 'The Structure and Physiology of the Cell in the Plant Organism.' The history and development of cytology as a special field in biology were traced, and the origin of the various theories of cell organization was indicated. The development of various theories respecting the centrosome and its rôle in cell division was discussed, the homologues of the centrosome to be found in ciliated cells and spermatozoa being indicated. After a review of the processes of cell division and their attendant phenomena, the methods of study of mitoses in plants and their proper illustration were considered. A great need exists for more accurate processes of reproduction than is afforded by plates made from camera lucida drawings. The latter are always more or less diagrammatic, and are apt to be modified by the personal bias of the investigator. Unconsciously the personal equation enters in. This is seen in recent work on the subject of the existence of the centrosome in higher plants. The difficulty referred to can be overcome by the employment of photomicrography. This has been made use of to a limited extent by zoologists in the study of mitoses, but apparently scarcely at all by botanists. The speaker showed some forty prints from photomicrographic negatives showing mitoses in rhizomes of *Erythronium albidum* and in microspore mother cells, and microspores in *Lilium philadelphicum* and *Pinus laricio* and megaspores in *Lilium Canadense*. The possibility which photomicrography affords, of giving structural details with relative fidelity, was illustrated by these photographs and by lantern slides.

Eight persons were elected active members of the Academy.

WILLIAM TRELEASE,
Recording Secretary.

AMERICAN MATHEMATICAL SOCIETY.

A REGULAR meeting of the Society was held at Columbia University on Saturday, April 28, 1900. As has grown to be the custom, a portion of the day was set apart for a joint meeting with the American Physical Society, at which papers noted below were read by Professors E. W. Brown and R. S. Woodward. President Woodward occupied the chair, yielding it during the joint session to Professor Hallock, of the Physical Society. The amendments to the constitution outlined in the report of the February meeting were adopted. The following persons were admitted to membership: Professor R. D. Ford, St. Lawrence University, Canton, N. Y.; Dr. L. W. Reid, Princeton University, Princeton, N. J. Eight applications for membership were received.

The following papers were presented at this meeting:

(1) DR. VIRGIL SNYDER: 'On some invariant scrolls in collineations which leave a group of five points invariant.'

(2) MR. A. S. GALE: 'Note on four theorems of Chasles.'

(3) PROFESSOR CHARLOTTE ANGAS SCOTT: 'A theorem on quadrilaterals in space.'

(4) MR. F. H. LOUD: 'Sundry theorems concerning n lines in a plane.'

(5) DR. E. J. WILCZYNSKI: 'Transformation of systems of linear differential equations.'

(6) PROFESSOR FLORIAN CAJORI: 'Semi-convergent and divergent series whose product is absolutely convergent.'

(7) PROFESSOR E. W. BROWN: 'A possible explanation of the eleven year period of sunspot activity.'

(8) PROFESSOR R. S. WOODWARD: 'An elementary method of integrating certain linear differential equations.'

(9) DR. G. A. MILLER: 'On a certain class of abelian groups.'

(10) PROFESSOR H. B. NEWSON: 'On singular transformation and continuous groups.'

(11) PROFESSOR E. O. LOVETT: 'Group theory and geometry of four dimensions.'

(12) PROFESSOR E. O. LOVETT: 'The condition that a linear total differential equation be integrable.'

(13) PROFESSOR C. H. HINTON: 'Observations on the principle of duality.'

After the meeting several members of the Mathematical and the Physical Societies dined and passed the evening agreeably together.

The summer meeting of the Society will be held at Columbia University, June 27th–30th in connection with the meeting of the American Association. F. N. COLE, *Secretary.*

COLUMBIA UNIVERSITY.

NEW YORK SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE regular monthly meeting of the New York Section of the American Chemical Society was held on Friday evening, April 6th, at the Chemists' Club, 108 West Fifty-fifth street. Dr. C. F. McKenna presided, and the following papers were read;

'A Method of Obtaining Nucleic Acid,' by Dr. P. A. Levene.

'Analysis of a Saline Deposit from Southern Nevada,' by Ralph W. Bailey.

'Notes on the Ferrocyanide Titration of Zinc,' by Dr. E. H. Miller and E. J. Hall.

Special announcement was made of an extra meeting to be held on May 2d, for the exhibition of novel forms of apparatus, products, etc., and that the meeting would be in the nature of a reception, to which the ladies and friends of the members would be invited. The Section on this occasion will be the guest of the Chemists' Club.

An invitation to attend the next meeting of the New York Section of the Society of Chemical Industry, to hear a paper on 'Petroleum and its Products,' by Dr. C. F. Newberry, signed by Dr. Parker, was then read, after which the meeting adjourned.

DURAND WOODMAN,
Secretary.

DISCUSSION AND CORRESPONDENCE.

PHYSICAL OBSERVATIONS DURING THE TOTAL SOLAR ECLIPSE.

TO THE EDITOR OF SCIENCE: While the most important observations during the total eclipse of the sun are, of course, astronomical, some simple physical observations can be made with little or no apparatus and may serve to elucidate two obscure atmospheric phenomena, namely, the so-called 'shadow-bands' and the changes in the direction and velocity of the wind.

Professor R. W. Wood, in SCIENCE of April 27, has described the appearance of the shadow-bands and has given instructions for observing them, so that, although I myself had prepared a circular of instructions for co-operating observers, yet, in consequence of the fact that so able a physicist as Professor Wood will study this phenomenon, I shall be glad to send him my own observations and any that I may receive. It may be interesting here to state briefly the results of the observations made and collected by Professor Winslow Upton, Mr. A. E. Douglass and myself during total solar eclipses. In the eclipse of August 19, 1887, observed in Russia, it was cloudy and no shadow-bands were seen, but in the eclipse of January 1, 1889, observed in California with a clear sky, the bands were well defined, though an attempt to photograph them failed. They were more prominent at high altitudes than at low levels, but they seem to have no connection with the position of the stations in or near the shadow-belt. While the reports of the various observers indicated a general agreement for the direction in which the bands lay, yet there was no uniformity in the direction of progression which seemed not to be related to the direction of the wind. In every case the speed of the bands was much less than that of the shadow itself, thus disproving the theory that the bands are diffraction fringes in the shadow of the moon. The observations are discussed by Professor Upton and myself in Vol. XXIX., No. 1, *Annals Astron. Observatory of Harvard College.* During the eclipse of April 16, 1893, observed in Chile under the most favorable circumstances, the shadow-bands were very generally seen immediately after totality. They lay approximately northwest and southeast, and moved mostly towards the southwest at a speed variously estimated at from three to twenty miles an hour. The width of the bands appeared to vary from one-eighth of an inch to four inches, and their distance apart from one to ten inches. A significant fact was that, contrary to the observations in the previous eclipse, the bands were much less conspicuous on the mountain summit, occupied by the writer, than near sea-level, where they were also coarser, thus indicating the effect of increased thickness of atmosphere.